

**AI-Assisted Academic Writing as Information Literacy: Writing Performance,
Student Agency, and Metacognitive Engagement in Higher Education**

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Abstract

We analyzed a purposive corpus of 53 empirical studies, drawn from 154 studies that met initial inclusion criteria, to examine generative artificial intelligence (AI) in higher education writing. The analysis addressed writing performance, writing processes, feedback and revision, student perceptions, and cognition and agency. Across the corpus, the clearest reported gains were in grammar, fluency, and organization; findings for critical thinking and originality were less consistent. Students appeared to benefit most when AI use was selective, iterative, and paired with instructor guidance. Our synthesis positions AI literacy as an extension of information literacy, emphasizing critical evaluation, metacognition, ethical use, and student agency.

Keywords: artificial intelligence, academic writing, higher education, generative AI, writing performance, information literacy

Introduction

In higher education, generative artificial intelligence (AI) is entering academic writing at multiple points in the process. Students use tools such as ChatGPT, Grammarly, and Gemini to generate ideas, draft text, revise arguments, and edit prose. In some writing contexts, AI therefore becomes part of the iterative exchange through which students develop and refine a text.

The educational consequences of that shift are less settled. Studies have documented improvements in grammar, fluency, organization, and other surface-level features, but evidence is less consistent for higher-order thinking, originality, and authorship. Students express a similar tension: they value AI's speed and convenience while questioning its accuracy, the risk of overreliance, and its implications for academic integrity. The result is a fast-growing but fragmented literature.

Part of the difficulty lies in how that literature is organized. Studies often isolate one dimension of AI use, such as performance outcomes or student perceptions, rather than considering writing processes, feedback practices, and cognitive engagement together. For instructional purposes, the distinction between a better written product and a better learning process matters. A broader synthesis can clarify both what changes in the text and what students are doing as they work with AI.

We therefore examine AI use in higher education academic writing across five areas: writing performance, writing process, feedback and revision, student perceptions, and cognition and agency. Our aim is not exhaustive coverage. By mapping a bounded analytic corpus, we

identify recurring patterns, tensions, and gaps that can inform future scholarship and instructional practice.

Methods

Search Strategy and Data Sources

We used a structured evidence-synthesis approach to identify research on the integration of artificial intelligence (AI) writing tools in higher education and then conducted detailed thematic analysis on a bounded, purposive corpus. We searched three major academic databases: ERIC, Web of Science, and PsycINFO. Together, these databases provided coverage of education-focused scholarship, interdisciplinary research on AI in learning, and cognitive and psychological perspectives on writing and thinking.

We organized the search strategy around five thematic concept blocks: (1) AI and generative AI writing tools, (2) higher education student populations, (3) academic writing contexts, (4) writing processes, and (5) learning outcomes related to critical thinking and creativity. We combined these blocks with Boolean operators and adapted each search to the syntax and field conventions of its database. Broad searches paired AI-related terms with higher education and academic writing concepts; more focused searches added terms related to critical thinking, creativity, and writing processes to capture studies addressing specific learning outcomes.

To supplement the database searches, we also searched the AI-powered research tool Elicit and the academic search platform Semantic Scholar. These searches were intended to identify recent, interdisciplinary, and emerging studies that might not yet be fully indexed in traditional databases. We screened all supplementary records using the same inclusion and

exclusion criteria as the database results and retained relevant studies not captured in ERIC, Web of Science, or PsycINFO to broaden the review's coverage.

We focused on recent, peer-reviewed empirical studies published in English. Most included studies were published in 2023 or later, reflecting the rapid development of generative AI technologies in educational settings. Appendix A provides representative search strings, and Appendix B lists the 53 studies included in the analytic corpus.

Study Selection and Data Charting

After importing all database and supplementary search records into reference management software, we removed duplicates and screened titles and abstracts against predefined inclusion criteria. Two reviewers conducted the screening, each taking responsibility for records retrieved from different database sources while applying shared inclusion and exclusion criteria. We then reviewed the full text of selected studies.

Screening yielded 154 studies that met the broad inclusion criteria. Because this project also served as an exploratory test of AI-assisted evidence mapping under bounded tool access and project resources, we did not conduct detailed extraction for all 154 records. Instead, we constructed a purposive analytic corpus of 53 studies. A study entered this corpus when (1) AI use was directly tied to students' academic writing rather than treated as a peripheral feature; (2) the article provided sufficient detail to identify the writing context, AI tool or approach, methodology, and relevant outcomes; (3) its findings could be mapped to at least one of the five analytic domains; and (4) the article was available in a form suitable for structured extraction. The resulting corpus was designed for in-depth thematic mapping rather than statistical representation of all eligible studies.

For each study in the analytic corpus, we charted the AI tool or technology examined, the academic writing context, the stage of writing (e.g., planning, drafting, revising), the research methodology, the learning outcomes addressed (e.g., critical thinking, creativity, agency), and the principal findings related to AI integration in writing processes. Table 1 summarizes the mapping and coding framework.

AI-Assisted Evidence Mapping

After the analytic corpus had been established, we used Elicit to assist with structured evidence mapping of the 53 studies. The tool organized study-level information about the AI technology or approach, academic writing context, stage of writing, methodology, learning outcomes, and principal findings. The authors reviewed the resulting map before thematic synthesis and retained responsibility for corrections, final categorizations, interpretations, and conclusions. Elicit was not treated as an independent source of evidence and did not make final eligibility or coding decisions.

Because Elicit access was usage-limited, detailed AI-assisted mapping was confined to the 53-study analytic corpus. The remaining 101 eligible studies were retained in the broader search record but were not included in the detailed thematic analysis. This boundary is reflected in the wording of the results and is addressed as a limitation.

Table 1

Data-Charting and Thematic Mapping Framework for the 53-Study Analytic Corpus

Mapping field	Information recorded	Use in analysis
AI tool or approach	AI system, writing assistant, automated evaluation tool, corpus-based intervention, or other reported technology	Described the technology or intervention being evaluated.
Academic writing context	Higher education setting, disciplinary or language context, and type of writing task, as reported	Situated findings and identified concentrations in particular contexts.

Mapping field	Information recorded	Use in analysis
Writing stage	Planning, drafting, feedback, revision, editing, or reflection	Traced how AI was used across the writing process.
Study methodology	Research design, data sources, and form of evidence, as reported by each study	Supported cautious interpretation of the reported findings.
Learning outcome	Writing performance, critical thinking, creativity, agency or metacognition, perceptions, and feedback or revision outcomes	Connected study findings to the review domains.
Principal findings	Reported benefits, limitations, conditions, and tradeoffs associated with AI use	Provided the evidence base for the narrative synthesis.
Primary thematic category	Writing performance (n = 26); writing process (n = 10); cognition/agency (n = 7); feedback/revision (n = 6); student perceptions (n = 4)	Assigned one principal theme to each study for consistent counting; secondary findings were retained in the narrative.

Note. Elicit assisted with organizing the mapped fields. The authors made all final coding and interpretive decisions. Counts reflect one primary theme per study and sum to 53.

Synthesis Approach

We did not formally appraise study quality. Within the 53-study analytic corpus, we used thematic synthesis to identify patterns of AI integration in academic writing, reported effects on critical thinking and creativity, and emerging conceptual trends. We also identified gaps and underexplored areas within the corpus to guide future research.

We assigned each study a primary theme based on its principal analytical focus: writing performance, feedback and revision, student perceptions, cognition and agency, or writing process. When a study addressed more than one dimension, we categorized it according to the primary outcome or phenomenon under investigation while retaining secondary findings in the narrative synthesis. This approach supported consistent classification and counting across the bounded analytic corpus.

Use of AI in Manuscript Preparation

Artificial intelligence tools supported the drafting and organization of portions of this manuscript, including the methods section. Elicit's role in evidence mapping is described above. The authors reviewed, edited, and verified AI-assisted manuscript content for accuracy, clarity,

and scholarly integrity. Responsibility for the final interpretations, synthesis, and conclusions remains with the authors.

Results

Thematic Findings

Our analysis of the 53-study corpus identified five primary themes: writing performance ($n = 26$), writing process ($n = 10$), cognition/agency ($n = 7$), feedback/revision ($n = 6$), and student perceptions ($n = 4$). These categories capture the principal ways AI was examined within the analytic corpus.

Writing Performance

Writing performance was the dominant theme, accounting for nearly half of the analytic corpus ($n = 26$). Among these studies, AI-assisted approaches, particularly those combined with corpus-based learning, outperformed traditional instruction and single-method approaches in grammar, vocabulary, cohesion, and task response (Rong et al., 2026; Wang et al., 2025; Pryma et al., 2025).

Within the writing-performance studies, the most frequently reported gains involved fluency, accuracy, and lexical diversity. Studies reported longer essays, fewer language errors, and improvements in organization, coherence, and linguistic precision (Sharshova et al., 2025; Shi et al., 2025; Hao & Razali, 2025). Taken together, these results point to AI's particular strength in supporting the surface-level and structural dimensions of writing within this group of studies (Pryma et al., 2025; Zamorano, 2025; Ding et al., 2025).

Within the analytic corpus, findings for higher-order writing were less consistent. Although AI-supported texts were often more fluent and grammatically accurate, overreliance on AI was associated with reduced originality and weaker argumentation (Tekir, 2026; Pryma et al., 2025). Improvements in linguistic quality, therefore, did not necessarily correspond to deeper critical or analytical development (Tekir, 2026; Rizkiani, 2024).

Feedback and Revision

The six studies centered on feedback and revision reported that AI could increase both the frequency and efficiency of revision. Compared with teacher feedback alone, AI-generated feedback was associated with higher revision rates, largely because it was immediate and offered specific, actionable suggestions (Tran, 2025; Wang & Xie, 2025).

More favorable outcomes appeared in hybrid feedback models that combined AI with instructor input. In these arrangements, AI addressed grammar, mechanics, and other surface-level concerns, while instructors concentrated on argumentation and conceptual development (Tran, 2025; Ding et al., 2025).

AI-generated feedback was also reported as broadly consistent with teacher evaluations, suggesting potential value as a supplementary assessment tool (Lu et al., 2024; Shi et al., 2025). When thoughtfully integrated, it may improve revision behavior while helping students interpret and act on instructor feedback (Lu et al., 2024; Guo et al., 2024).

Student Perceptions

Students in the four **student perceptions** studies generally viewed AI writing tools positively, especially for efficiency, clarity, and feedback. They valued assistance with grammar and vocabulary and often described AI as reducing writing-related anxiety (Song & Song, 2023; Mahapatra, 2024; Seelro & Khan, 2024).

Their enthusiasm was tempered by awareness of AI's limitations. Students raised concerns about overreliance, diminished critical thinking, threats to originality, academic integrity, and the preservation of an authentic voice (Wang, 2024; Kim et al., 2025; Black & Tomlinson, 2025).

Even so, students generally described AI as a support for human thinking rather than a replacement for it. They emphasized augmentation: using AI to extend, clarify, or refine their own writing processes without surrendering authorship (Yang et al., 2024; Gawlik-Kobylińska, 2024; Black & Tomlinson, 2025).

Cognition and Agency

The seven studies on **cognition and agency** shifted attention from whether students used AI to how they used it. They identified distinct patterns of engagement, with different patterns producing different learning outcomes (Yang et al., 2024; Nguyen et al., 2024).

Agency emerged as a central condition of effective use. Selective and strategic engagement with AI supported stronger critical thinking, preservation of personal voice, and deeper involvement in writing tasks (Tekir, 2026; Wang, 2024). By contrast, frequent or

uncritical reliance tended to yield fluent but less original writing and lower cognitive engagement.

Metacognitive awareness, critical reasoning, and epistemic beliefs also shaped students' ability to evaluate AI-generated content and avoid incorporating inaccurate or misleading information (Urban et al., 2025; Tekir, 2026).

Writing Process

The ten studies focused on the **writing process** showed students using AI at every stage, from planning and drafting to revision. Their uses ranged from global concerns, such as brainstorming and organization, to local concerns, such as grammar and sentence structure (Wang, 2024; Karanjakwut & Charunsri, 2025; Jacob et al., 2024).

Within the ten writing-process studies, stronger outcomes were reported when students engaged with AI actively and reflectively. Rather than accepting feedback passively, they refined, evaluated, and revised AI-supported text as part of a metacognitive process (Nguyen et al., 2024; Parker et al., 2025; Ren et al., 2025).

Within this part of the corpus, the findings point toward hybrid pedagogical models that pair established writing practices with strategic, guided AI use (Hutson et al., 2024; Wang & Ren, 2024). Such models retain an emphasis on critical thinking, ethical use, and student authorship while incorporating AI into instruction (Parker et al., 2025; Hutson et al., 2024).

Discussion

Interpreting the Current Landscape of AI-Assisted Academic Writing

The most visible pattern in our analytic corpus is an imbalance in what the field has measured. Of the 53 studies, research concentrated most heavily on writing performance, where improvements in grammar, organization, and fluency were frequently reported (Pryma et al., 2025; Shi et al., 2025; Hao & Razali, 2025; Sharshova et al., 2025). Far fewer included studies examined how students regulate AI use, critically evaluate its output, or develop the metacognitive skills needed to work with it effectively (Yang et al., 2024; Urban et al., 2025; Tekir, 2026). The corpus therefore tells us more about written products than about the cognitive activity surrounding AI-assisted writing.

That imbalance matters because product quality and learning are not the same outcome. Evidence within the analytic corpus is more developed for improvements in written output (Rong et al., 2026; Wang et al., 2025; Zamorano, 2025) than for the ways AI shapes learning, authorship, and intellectual growth (Tekir, 2026; Jacob et al., 2024; Khuder, 2025). What AI does to a text and how students think with AI during composition remain distinct questions (Nguyen et al., 2024; Wang, 2024; Parker et al., 2025).

Surface-Level Gains and Higher-Order Tradeoffs

Across the five themes, one pattern complicated the positive performance findings: gains in surface-level features did not reliably carry over to higher-order writing abilities. Included studies associated AI use with grammatical accuracy, lexical diversity, and structural coherence (Pryma et al., 2025; Tekir, 2026; Aiman et al., 2025), while the cognition and agency studies

associated frequent or uncritical reliance with reduced originality, weaker argumentation, and diminished critical engagement (Tekir, 2026; Pryma et al., 2025; Seelro & Khan, 2024).

The resulting paradox is central to this synthesis:

AI can simultaneously improve the quality of written text while potentially constraining the development of deeper writing and thinking skills (Aiman et al., 2025; Rizkiani, 2025).

The corpus does not suggest that this tension is simply a defect of AI. Outcomes varied with how students used the technology (Yang et al., 2024; Tekir, 2026). Strategic and selective engagement helped preserve critical thinking and authorial voice, whereas passive reliance shifted cognitive effort away from the student (Tekir, 2026; Urban et al., 2025; Pryma et al., 2025).

The Central Role of Student Agency and Metacognition

Among the seven cognition and agency studies, agency emerged as a prominent condition of effective AI use. Students who questioned, revised, and evaluated AI outputs demonstrated stronger learning than those who treated AI as a substitute for their own thinking (Yang et al., 2024; Tekir, 2026; Parker et al., 2025).

This pattern closely parallels **information literacy**, particularly the practices of evaluating sources, assessing credibility, and engaging critically with information systems. AI extends those practices beyond conventional source evaluation: students must assess generated content for accuracy, reasoning, bias, and completeness (Urban et al., 2025; Wang, 2024; Khuder, 2025).

Metacognitive awareness and epistemic beliefs further influenced whether students could use AI effectively. Those who recognized AI's limitations and monitored their own understanding were better positioned to identify and reject inaccurate or misleading information (Urban et al., 2025; Tekir, 2026). Effective AI use, in this sense, is less a discrete technical skill than a cognitive and epistemic practice (Yang et al., 2024; Urban et al., 2025; Parker et al., 2025).

Implications for AI Literacy and Information Literacy

For us, this is where the findings connect most directly to information literacy. We position AI literacy not as a separate competency domain, but as an extension of information literacy. Patterns within the analytic corpus align closely with concepts articulated in the ACRL Framework for Information Literacy for Higher Education (Association of College and Research Libraries [ACRL], 2016).

The writing-process findings align with *Searching as Strategic Exploration*: students used AI to generate, refine, and organize ideas while navigating complex writing tasks, but successful use required strategy rather than passive acceptance. The cognition and agency findings similarly reflect *Research as Inquiry*. Students achieved stronger outcomes when they questioned, evaluated, and refined AI-generated content iteratively instead of treating AI as a source of ready-made answers.

The analytic corpus also reinforces *Authority Is Constructed and Contextual*. Because AI-generated content often lacks transparent authorship, provenance, and evidentiary support, students must evaluate both the output and the conditions under which a system produced it. Feedback and revision, meanwhile, connect with *Scholarship as Conversation*. AI can participate

in iterative exchanges that support idea development and revision, but it does not contribute original scholarship and cannot replace engagement with human authors, disciplinary perspectives, or scholarly discourse.

This framing places AI tools in a middle position. They are more than productivity technologies, but they are not autonomous scholarly partners. Their educational value depends on students' judgments about when to use them, what to accept, and what to question. Instruction grounded in the ACRL Framework should therefore emphasize critical engagement with AI-generated content, responsible integration into research and writing workflows, and learner agency in deciding when and how to use AI-supported outputs.

Evolving Writing Processes and Pedagogical Shifts

The writing-process studies depict AI-supported writing as iterative and interactive, with students moving repeatedly among brainstorming, drafting, feedback, and revision. This pattern departs from linear models of composition and points instead to fluid, recursive workflows shaped by ongoing exchanges with AI systems.

These workflows appeared more productive within hybrid pedagogical models in which AI complemented rather than replaced established instruction. Instructors remained essential, especially in helping students distinguish surface-level editing from the deeper work of developing arguments and concepts.

Taken together, the findings informed an integrated, iterative model of AI-assisted writing in which AI operates across multiple stages while student agency and metacognitive awareness mediate its effects. Within such a model, effective instruction should emphasize:

- explicit guidance on when and how to use AI
- structured opportunities for reflection on AI use
- continued emphasis on authorship, argumentation, and critical thinking

Figure 1*AI-Integrated Academic Writing Framework*

Note. Author-developed synthesis based on findings from the analytic corpus.



Figure 1 distills these patterns into an author-developed conceptual model. It presents AI-supported writing as an iterative process spanning planning, drafting, feedback, revision, and reflection, with student agency and metacognition mediating the relationship between AI use and writing outcomes.

Gaps in the Analytic Corpus and Future Directions

The 53-study analytic corpus leaves important questions unresolved. Most notably, few included studies followed students long enough to determine whether AI-supported writing produces durable improvement rather than short-term performance gains.

The included studies also offered relatively little evidence about how students learn from AI feedback. They commonly documented changes in writing quality, but less often asked whether students internalized corrections or transferred what they learned to later writing tasks.

Within the analytic corpus, work on cognition and agency remained limited in comparison with performance-focused research. Longitudinal studies are needed to clarify how AI affects thinking processes, intellectual independence, and knowledge construction over time.

Finally, the concentration of included studies in ESL/EFL populations limits the transferability of this synthesis across disciplines, institutional settings, and student groups.

Limitations

Five limitations shape the interpretation of this review. First, although 154 studies met the broad inclusion criteria, detailed AI-assisted mapping and thematic analysis were limited to a purposive corpus of 53 studies. This boundary reflected the exploratory aim of the project and bounded access to Elicit and other project resources. The stated selection criteria improve transparency, but they do not make the corpus statistically representative; relevant findings from the remaining 101 eligible studies may therefore be absent. Claims in this article should be interpreted as applying to the analytic corpus rather than to the entire literature.

Second, two reviewers divided the database results and applied shared inclusion and exclusion criteria. Because not all records were double-screened, we did not calculate formal inter-rater reliability, and screening judgments may have varied.

Third, Elicit assisted with structured evidence mapping. Although the authors reviewed the resulting map and retained responsibility for the final analysis, automated extraction can introduce omissions, oversimplifications, or inconsistencies. The mapped fields should therefore be understood as an AI-assisted organizational aid rather than a substitute for author judgment.

Fourth, the pace of technological change limits the durability of the findings. Many included studies examined early versions of AI tools and may not represent the capabilities of newer or emerging systems. The conclusions should therefore be read as a snapshot of a research and technological landscape that continues to change rapidly.

Fifth, the included studies differed in design, sample size, and context, with a notable concentration on ESL/EFL learners. This concentration limits generalizability across higher education disciplines and settings. A stronger evidence base will require longitudinal research, more diverse populations, and more consistent reporting of outcomes.

Conclusion

The 53-study analytic corpus does not support a simple conclusion that AI either improves or diminishes academic writing. Its effects were substantial but uneven. The clearest reported benefits involved grammatical accuracy, organization, fluency, and other surface-level features; findings for critical thinking, originality, authentic voice, and argument development depended more heavily on how students engaged with the tools.

Across the corpus, access to AI mattered less than the practices students built around it. Strategic, reflective use could support learning, while uncritical reliance could reduce cognitive

engagement and intellectual ownership. Student agency, critical evaluation, and metacognitive awareness therefore help determine whether AI functions as a resource for learning or a substitute for the intellectual work of writing.

For educators and librarians, this shifts the instructional problem away from a simple choice between permitting and restricting AI. Students need repeated opportunities to decide when AI use is appropriate, evaluate generated content, incorporate assistance ethically, and remain responsible for their arguments and prose. These practices belong naturally within information literacy and academic writing instruction.

The next research problem is not simply whether newer AI systems produce better text. The field needs stronger evidence about sustained learning, cognitive development, and the changing nature of authorship in AI-mediated environments. Following those questions over time would help clarify not only whether AI improves writing, but how it reshapes students' thinking, learning, and participation in scholarly work.

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Appendix A

Representative Search Strategies by Database

Table A1

Search Strategy for ERIC

Concept Block	Search Terms
AI Writing Tools	"artificial intelligence" OR "generative AI" OR ChatGPT OR "AI writing tool*" OR "large language model"
Population	"higher education" OR "university student*" OR "college student*" OR undergraduate* OR "graduate student"
Writing Context	"academic writing" OR "research paper*" OR "academic essay*" OR "thesis writing"
Writing Process	"writing process" OR brainstorming OR revising OR editing OR argumentation
Learning Outcomes	"critical thinking" OR "analytical thinking" OR creativity OR "authorial voice"
Combined Example	(AI Writing Tools) AND (Population) AND (Writing Context) AND (Learning Outcomes)

Table A2*Search Strategy for Web of Science*

Concept Block	Search Terms (TS = Topic)
AI Writing Tools	TS=("artificial intelligence" OR "generative AI" OR ChatGPT OR "AI writing tool*" OR "large language model*")
Population	TS=("university student*" OR "college student*" OR undergraduate* OR "graduate student*")
Writing Context	TS=("academic writing" OR "research paper*" OR "academic essay*" OR "thesis writing")
Writing Process	TS=("writing process" OR brainstorming OR revising OR editing OR argumentation)
Learning Outcomes	TS=("critical thinking" OR creativity OR "authorial voice")
Combined Example	(AI Writing Tools) AND (Population) AND (Writing Context) AND (Learning Outcomes)

Table A3*Search Strategy for PsycINFO*

Concept Block	Search Terms
AI Writing Tools	"artificial intelligence" OR "generative AI" OR ChatGPT OR "AI writing tool*" OR "large language model*"

Concept Block	Search Terms
Population	student* OR undergraduate* OR "college student*" OR "university student*"
Writing Context	"academic writing" OR "research paper*" OR "academic essay*" OR "writing tasks"
Writing Process	"writing process" OR brainstorming OR revising OR editing OR argumentation
Learning Outcomes	"critical thinking" OR metacognition OR creativity OR "learner agency"
Combined Example	(AI Writing Tools) AND (Population) AND (Writing Context) AND (Learning Outcomes)

Note. Search strings were adapted slightly across databases to align with database-specific syntax and controlled vocabulary where applicable.

Appendix B

Included Studies in the Analytic Corpus (n = 53)

The following studies were included in the analytic corpus and subjected to detailed data extraction and thematic analysis.

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